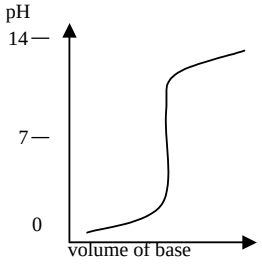
RT18 – HL 18.4-5 IB Practice

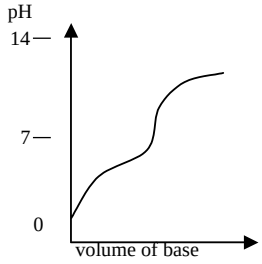
Name……

1. Which graph shows how the pH changes when a weak base is added to a strong acid?

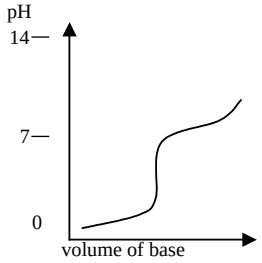
A



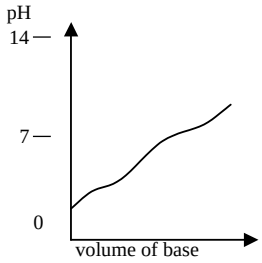
B



C



D



2. A base of concentration 0.10 mol dm^{-3} is titrated with 25 cm^3 of an acid of concentration 0.10 mol dm^{-3}. Which base-acid pair would have the highest pH at the equivalence point?

A. NaOH(aq) and CH_3COOH(aq)

B. NaOH(aq) and HNO_3(aq)

C. NH_3(aq) and HNO_3(aq)

D. NH_3(aq) and CH_3COOH(aq)

3. An acid-base indicator has a pK_a value of 4.0. At what pH will this indicator change colour?

A. 2.0

B. 4.0

C. 8.0

D. 12.0

4. Which statement about indicators is **always** correct?

A. The mid-point of the pH range of an indicator is 7.

B. The pH range is greater for indicators with higher pK_a values.

C. The colour red indicates an acidic solution.

D. The pK_a value of the indicator is within its pH range.

5. 0.100 mol dm^{-3} hydrochloric acid solution is added to 25.0 cm^3 0.100 mol dm^{-3} ammonia solution and the pH is recorded until a total of 35.0 cm^3 hydrochloric acid has been added.

(i) Sketch a graph to show how the pH changes as hydrochloric acid is added to the ammonia solution. Use a pH scale of 0–14, and an acid volume scale of 0–35 cm^3. Explain the shape of the curve.

(6)

(ii) Use table 17 of the Data Booklet to suggest an indicator that could be used in the titration, explaining your choice.

(2)

(Total 8 marks)

6. The indicator bromophenol blue, HIn(aq), has a form that is yellow and an In^-(aq) form that is blue.

(a) Write an equation to show how bromophenol blue acts as an indicator.

(1)

(b) State and explain the colour of bromophenol blue

(i) on the addition of a strong acid.

(ii) at the equivalence point of a titration.

(3)

(Total 4 marks)

7. An experiment was carried out to determine the concentration of an aqueous solution of ammonia by titrating it with a solution of sulfuric acid of concentration 0.150 mol dm^{-3}. It was found that 25.0 cm^3 of the ammonia solution required 20.1 cm^3 of the sulfuric acid solution for neutralization.

(a) Write the equation for the reaction and calculate the concentration, in mol dm^{-3}, of the ammonia solution.

(4)

(b) Several acid-base indicators are listed in Table 17 of the Data Booklet. State and explain which one of the following indicators should be used for this experiment: bromocresol green, phenol red or phenolphthalein.

(3)

(c) Determine the pOH of a solution with an ammonia concentration of 0.121 mol dm^{-3}.
(pK_b of ammonia is 4.75.)

(4)

(Total 11 marks)

8. (i) Define the term pH.

(1)

(ii) A 25.0 cm^3 sample of 0.100 mol dm^{-3} hydrochloric acid was placed in a conical flask, and 0.100 mol dm^{-3} sodium hydroxide is added until a total of 50.0 cm^3 had been added. Sketch a graph of pH against volume of NaOH(aq) added, clearly showing the volume of NaOH(aq) needed for complete reaction and the pH values at the start, the equivalence point and finish.

(4)

(iii) The experiment in (ii) was repeated, but with a 25.0 cm^3 sample of 0.100 mol dm^{-3} ethanoic acid in the conical flask instead of the hydrochloric acid. Use information from Table 16 of the Data Booklet to calculate the pH at the start of the experiment. State the approximate pH value at the equivalence point.

(5)

(Total 10 marks)